

## WE CLAIM:

1. A compound of molecular formula I,



wherein  $2.2 < x < 4$ ,  $0 < y < 2$  and  $z \geq 0$ .

2. A compound according to Claim 1, wherein formula I ,  
 $2.2 < x < 4$  and  $0.1 \leq y \leq 1.75$ .
3. A compound according to Claim 1, wherein formula I ,  
 $2.2 < x < 3.6$  and  $0.1 \leq y \leq 1.75$ .
4. A compound according to Claim 1, further characterised by the normalised crystallographic unit cell volume, when indexed in hexagonal symmetry to a R-3m structure, being smaller than that of  $\text{LiCrO}_2$  ie. smaller than 104.9 cubic Angstroms.
5. A compound according to Claim 1, further characterised by the average cation to anion bond distance being smaller than that of  $\text{LiCrO}_2$ .
6. A compound according to Claim 1, wherein formula I,  $x = 2.8$  to  $3.4$ ,  $y = 0.49$  to  $1.46$  and  $z = 0.5$  to  $2.6$ .
7. A compound according to Claim 1, wherein formula I,  $x = 2.8$  to  $3.4$ ,  $y = 1.01$  to  $1.46$  and  $z = 0.9$  to  $1.9$ .

8. A compound according to Claim 1, wherein formula I,  $x = 2.8$  to  $3.3$ ,  $y = 0.49$  to  $0.93$  and  $z = 0.5$  to  $2.6$ .
9. A compound according to Claim 1, wherein formula I,  $x = 2.04$  to  $3.44$ ,  $y = 0.51$  to  $1.34$  and  $z = 0.07$  to  $1.86$ .
10. A compound according to Claim 1, wherein formula I,  $x = 2.25$  to  $3.44$ ,  $y = 0.98$  to  $1.34$  and  $z = 0.37$  to  $1.86$ .
11. A compound according to Claim 1, wherein formula I,  $x = 3.15$  to  $3.30$ ,  $y = 0.89$  to  $1.09$  and  $z = 1.00$  to  $1.54$ .
12. A compound according to Claim 1, wherein formula I,  $x = 2.95$ ,  $y = 1.09$  and  $z = 0.11$ , further characterised by a normalised unit cell volume of  $102.1$  cubic angstroms and being indexed to a hexagonal crystallographic unit cell having dimensions  $a = 2.87\bar{6}$  angstroms,  $b = 2.87\bar{6}$  angstroms, and  $c = 14.2\bar{5}$  angstroms.
13. A cathode for use in a secondary lithium ion electrochemical cell, comprising as active material a compound of formula I as defined in Claim 1.
14. A secondary lithium ion electrochemical cell comprising, a lithium intercalation anode, a suitable non-aqueous electrolyte including a lithium salt, a cathode as defined in Claim 13, and a separator between the anode and cathode.
15. An electrochemical cell according to Claim 14, wherein the anode comprises a material selected from the group consisting of transition metal oxides, transition metal

sulphides and carbonaceous materials, and wherein the electrolyte is in liquid form and includes a suitable organic solvent.

16. An electrochemical cell according to Claim 15, wherein the lithium salt is selected from the group consisting of  $\text{LiAsF}_6$ ,  $\text{LiPF}_6$ ,  $\text{LiBF}_4$ ,  $\text{LiClO}_4$ ,  $\text{LiBr}$ ,  $\text{LiAlCl}_4$ ,  $\text{LiCF}_3\text{SO}_3$ ,  $\text{Li}(\text{CF}_3\text{SO}_2)_3$ ,  $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ , and mixtures thereof.
17. An electrochemical cell according to Claim 16, wherein the organic solvent is selected from the group consisting of propylene carbonate, ethylene carbonate, 2-methyl tetrahydrofuran, tetrahydrofuran, dimethoxyethane, diethoxyethane, dimethyl carbonate, diethyl carbonate, methyl acetate, methylformate,  $\gamma$ -butyrolactone, 1,3-dioxolane, sulfolane, acetonitrile, butyronitrile, trimethylphosphate, dimethylformamide and other like organic solvents and mixtures thereof.
18. An electrochemical cell according to Claim 17, wherein the anode comprises a carbonaceous material.
19. An electrochemical cell according to Claim 18, wherein the anode comprises a graphitic carbon.
20. An electrochemical cell according to Claim 18, wherein the electrolyte is a solid or gelled polymer.

21. An electrochemical cell according to Claim 18, wherein the electrolyte comprises 1 M  $\text{LiPF}_6$  in a 1:1 mixture of ethylene carbonate and dimethyl carbonate.
22. An electrochemical cell according to Claim 19, wherein formula I,  $x = 2.2$  to 4,  $y = 0.1$  to 1.75 and  $z \geq 0$ .

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